

ABSTRACT

A chemical processing microsystem useful for identifying and optimizing materials (e.g., catalysts) that enhance chemical processes or for characterizing and/or optimizing chemical processes is disclosed. The chemical processing microsystem comprises a plurality of microreactors 600 and, in a preferred embodiment, a plurality of microseparators 900 integral with the chemical processing microsystem 10. The microreactors 600 are preferably diffusion-mixed microreactors formed in a plurality of laminae that include a modular, interchangeable candidate-material array 100. The material array 100 comprises a plurality of different candidate materials (e.g., catalysts), preferably arranged at separate, individually addressable portions of a substrate (e.g., wafer). The microseparators 900 are similarly formed in a plurality of laminae that include a modular, interchangeable adsorbent array 700. The adsorbent array 700 comprises one or more adsorbents, preferably arranged at separate, individually addressable portions of a substrate to spatially correspond to the plurality of different candidate materials. Modular microfluidic distribution systems are also disclosed. The chemical processing microsystem can be integrated into a material evaluation system that enables a comprehensive combinatorial material science research program.

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